





# Effect of ball to powder ratio on the mechanosynthesis of $\text{Re}_2\text{C}$ and its compressibility

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<https://doi.org/10.1016/j.jallcom.2019.151867> 

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## Highlights

- Increment on the ball to powder ratio (BPR) reduces the mechanosynthesis time of  $\text{Re}_2\text{C}$ .
- Mechanosynthesis of  $\text{Re}_2\text{C}$  was obtained at BFR of 230:1, 30 min of milling, accumulated energy  $> 500 \frac{\text{kJ}}{\text{g}}$  and transferred energy  $> 2.656 \times 10^{-14}$  kJ.
- Cold working and defects generated during high-energy ball-milling do not have a significant effect in bulk modulus of  $\text{Re}_2\text{C}$ .

## Abstract

The mechanosynthesis of hexagonal rhenium carbide ( $\text{Re}_2\text{C}$ ) from the elements is explored as a function of the balls to powder ratio (BPR). Burgios's equation has been used to calculate the accumulated energy ( $\Delta E_{\text{accum}}$ ) and the transferred energy per hit ( $\Delta E_b$ ). To get the complete mechanosynthesis of  $\text{Re}_2\text{C}$  several conditions have to be met:  $\text{BPR} > 115:1$ ,  $\Delta E_{\text{accum}} > 500 \frac{\text{kJ}}{\text{g}}$ , and